2.10 Site Facilities and Infrastructure

The proposed project facilities will be built on the north side of the valley near the headwaters of the Wolverine Lake and Go Creek watersheds. Site investigation work included test pits, substrate sampling and compaction testing, and the installation of groundwater monitoring wells at key locations in the industrial complex and waste rock pad areas (Figure 2.10-1). This work was completed in early summer 2005 and formed the basis for subsequent project design, as shown in the overall project layout (Figure 2.10-2). The main industrial complex is near to the portal entrance to the underground mine in the Wolverine drainage area and the camp, airstrip and tailings facilities are located in the Go Creek watershed, 2-4 km to the southeast of the industrial area. The current project is anticipated to be 12 years, however, project facilities will be designed for a 15-20 year life, with the expectation that additional economic mineralization may be found in the area.

Figure 2.10-1 Plant Site and Waste Rock Pile Site Investigation Plan (Vol. 2)

Figure 2.10-2 Overall Project Layout (Vol. 2)

Infrastructure at the industrial area includes: mine portals and ventilation intakes, local access roads and laydown areas, crusher, industrial complex buildings, power generation plant, laboratory, fuel storage farm, water supply, sewage treatment, surface settling and polishing ponds, waste disposal facilities, and explosives storage (magazines) to the west (Figure 2.10-3). Site drainage will be collected in ditches around the industrial area and diverted to the surface sumps for subsequent treatment (Section 2.9: Site Water Management). Surface runoff will be diverted away from the industrial area, and allowed to naturally drain downslope.

Figure 2.10-3 Industrial Complex Area Layout (Vol. 2)

Infrastructure required for support of the mine and process plant, but located outside of the industrial area, includes the accommodation complex, water supply and storage, potable water treatment, waste disposal, sewage treatment, first aid station, airstrip, incinerator, landfill, tailings facility, waste rock pad, and mine access road (Figures 2.10-2 and 2.10-4).

Figure 2.10-4 Camp Area Layout (Vol. 2)

The facilities descriptions below provide information to highlight the potential effects of the mining, processing and auxiliary operations on the environment, including:

- location, configuration and construction

- services and supplies required by the facility
- emissions and discharges as part of normal operation
- preventative and safety features of the facility

As noted in Section 1.2 Project Background, this EA Report is based on pre-feasibility engineering design. Engineering efforts will continue to advance to detailed design starting in late fall 2005. This may include additional field testing and sampling to support engineering studies. As engineering proceeds, and as the proposed project is further reviewed and discussed with communities and regulators, improvements in the project design may be identified that result in minor changes to the project description described herein. However, the overall scope of the project will remain as summarized below.

2.10.1 Underground Mine

The existing mine portal is located at elevation of 1,345 m asl (1345 Portal). A new portal will be constructed at 1,360 m asl (1360 Portal) to improve access for the ore trucks emerging from underground to the crusher. For detailed information on underground facilities, refer to Section 2.5: Mine Plan.

The underground mine will require separate openings to supply fresh ventilating air and to exhaust return air. The 1345 Portal will be used for ventilation. Intake air will be heated in the winter using specialized propane fired equipment located on the surface adjacent to the intakes. Liquid propane will be stored under pressure in “torpedo” tanks near the heaters, and vaporized through conventional pressure relief equipment before use. A typical arrangement is shown in Figure 2.10-5a. The propane supply contractor will replenish the torpedo tanks from an approved highway propane tanker truck. It is normal for the propane contractor to provide the torpedos and vaporizing equipment to comply with specialized codes and regulations.

The existing roads and laydown areas around the industrial complex are constructed of compacted gravel and will be maintained year around, including snow removal. Vehicles using these areas near the portal will include mobile drills, rock bolting machines, scissor lifts, haul trucks, dumpers, graders and light utility trucks.

Figure 2.10-5a A Typical Installation Arrangement of Four Torpedo Propane Tanks and Vaporizer

2.10.2 Industrial Complex

The primary industrial complex building contains the crushing plant, ore processing plant, water treatment plant, and potable water treatment and storage. The secondary industrial complex building contains workshops and warehouse, emergency response station, and offices and dry. The two buildings are subsequently referred to herein as the industrial complex. Plan and cross-section views for the industrial complex are contained in Figures 2.10-3 and 2.10-5, respectively.

Figure 2.10-5 Industrial Complex Sections (Vol. 2)

The building will be a purpose-built pre-engineered two storey structure covered with corrosion resistant metal siding. They will be constructed on engineered, reinforced concrete foundations that will be contiguous with the concrete floor. The floor will

include sumps to contain all spills that occur within the building. Spills will be cleaned up and pumped from the sumps into the process stream.

2.10.3 Crushing Plant

Ore will be hauled from the mine to the dump pocket by open top 40 t (18 m^3) trucks. The truck dump, grizzly and rock breaker will be elevated to provide surge capacity ahead of the crusher. The rock breaker will reduce oversize material not passing through the stationary grizzly. The ore will be reduced to <25 mm by two-stage crushing and screening. The product will be stored in a bin beside the dense media separation (DMS) plant. After the first stage of crushing, all the ore will be transported on belt conveyors until it is mixed with water and pumped as slurry into the DMS and grinding plants. The crushing plant is detailed in Section 2.6: Ore Processing.

The handling and transfer of the ore will generate dust. The amount of dust generated will vary, and will depend on the water content and the particle size distribution of the ore. The transit of the haul trucks from the portal to the dump pocket will be approximately 125 m. The short duration and distance will limit fugitive dust emitted from the trucks. All belt conveyors will be enclosed. The crushing and screening plants and the crushed ore bin will be enclosed in the heated industrial complex equipped with dedicated dust filters. Ore chutes and feeders within these plants will themselves be enclosed to contain dust. The material captured by the dust collector units will be deposited into transport bags and periodically introduced into the ore slurry processing stream in the grinding area.

The dump pocket, grizzly and rock breaker will be enclosed. The pocket will be designed to minimize the amount of fugitive dust by reducing the drop height from the truck to the surface of the apron feeder. The operation of the stationary grizzly in conjunction with the rock breaker will not be a significant source of dust due to the relatively small amount and large size of the material.

2.10.3.1 Processing Plant

The process flow description for activities within the industrial complex including the dense media separation, grinding, and flotation and dewatering systems is included in Section 2.6: Ore Processing.

Each of the flotation processes and the thickeners will require substantial amounts of water for the initial charging of the system. This is estimated to be of the order of 3000 m^3 but the quantity will depend on detailed design and the specific equipment selected. The initial charge will be collected from the Wolverine Creek well, and water pumped out of the underground mine. Water requirements during operations are discussed Section 2.9: Site Water Management. Process water will be largely provided by water reclaimed from the tailings facility. No dust collection will be required inside the process areas as all processes are wet processes.

Process reagents will be stored in an enclosed, designated part of the processing area of the industrial complex. Unloading of reagents from the delivery trucks will take place within the building. The area will have a concrete slab floor, a sump and pump to contain and recover chemicals and wash water in case of spill. Separate containment areas will be provided for each reagent to prevent the accidental mixing of the chemicals.

The recovered waste heat from the diesel generators in the Power Plant will provide space heating within the industrial building. Electric heaters will provide additional space heating.

2.10.3.2 Water Treatment Plant

The water treatment plant will be inside the process area of the primary building.. The plant will discharge via a buried, heat traced and insulated pipeline to a polishing pond south east of the industrial complex. Sections 2.6: Ore Processing and 2.9 Site Water Management provide a description of the water treatment process, equipment and management.

2.10.3.3 Mine and Maintenance Support Facilities

Operation and maintenance support facilities in the secondary building include the mine dry, warehouse, maintenance shop and offices. The mine dry will be located on the ground floor and will provide segregated, gender appropriate changing and showering facilities. Shift bosses wickets will be provided in a general mustering area in the dry. Several 300 L electrically heated hot water tanks will provide hot water for the facility.

The warehouse will include a receiving area, dispatch office and heated storage area equipped with racks on the main and mezzanine floors. Robust items will be stored outside in the designated storage pad area.

The maintenance shop will be located on the ground floor next to the warehouse. The shop will consist of one wash bay, two heavy vehicle maintenance bays, one light vehicle maintenance bay, a welding and machine shop and a small enclosed electrical, instrumentation and hydraulic repair shop. The heavy vehicle bays will be able to accommodate a 40 t truck or a 7 m^3 front-end-loader. The shop will be equipped with a 15 t overhead crane. The services required in the maintenance shop will include power for equipment and welding machines, compressed air for power tools, overhead lights for general lighting, heating and a sump. The sump will be equipped with an oil water separator. The maintenance shop will be supplied with domestic and industrial waste disposal facilities (Section 9.4: Waste Management Plan)

Offices and washrooms will be located on the second floor of the secondary building.

2.10.3.4 Water Supply and Storage

The mine site will require water for rock drills and the auxiliary underground equipment, make-up water for the ore processing plant, potable water for the site personnel and water for the fire hydrants and sprinklers. The water tank will be located in the primary building near the thickeners. The heated and insulated tank will be designed to provide a guaranteed minimum 2 h of storage for fire fighting at 340 m^3/h in addition to 4 h of storage for potable and process make up water. Water for fire-fighting purposes will be reserved in the bottom of the tank. The storage tank will be re-filled continuously from the existing Wolverine Creek well west of the industrial area. Potable water will be treated and distributed in a pressurized loop.

The firewater distribution system will be installed to provide for wall hydrants at strategic locations. Outdoor supply lines will be buried, insulated and heat traced. The fire pump will be diesel operated and underwriter approved to ensure an uninterrupted supply of firewater in case of power failure.

2.10.3.5 Emergency Response Station

The emergency response station in the secondary building will be equipped for first aid, environmental and mine rescue activities. The first aid room will be separate from the environmental response and mine rescue room where specialized equipment must be stored and maintained. The first aid room will be fully serviced with hot and cold water, toilets and communications. A subsidiary first aid room will be located in the camp. The existing helipad at the southwest corner of the industrial complex area, as shown in 2.10-3, will be retained as part of the emergency response facilities.

2.10.4 Power Generation

A reliable and secure source of electrical power is required for the operation of the industrial complex, camp and the tailings facility. The power generation plant will be located adjacent to the ore processing section of the primary building and the fuel farm (Figure 2.10-3). Power for the camp and tailings facility will be supplied via a transmission line from this plant.

Assuming that planned trade off studies support electrical space heating over propane, the power plant will consist of eight 1.6 MW diesel gensets, one 150 KW black start generator, day tanks, a control rooms, transformers and switchgear. Six gensets will operate at any time, one will provide the swing capacity for surges in demand and one genset will be off line for schedule maintenance. Each generator will be enclosed and insulated as part of the original supply and placed on concrete foundation.

The diesel engines will be 1,200/1,800 rpm, four stroke, turbo charged, direct injection engines with electronic fuel injection. The provision of electronic fuel injection significantly improves fuel economy. The diesel fuel will be automatically pumped from the bulk storage to the individual day tanks which are built into the generator packages. The engines will use No. 1 or No. 2 diesel fuel. The No. 2 “light fuel” is considered more economical to burn in the power station than the No.1 winter type. The gensets will be able to burn the No. 1 diesel (or P40 or P50) if necessary. The power station will be programmable logic controlled and completely automatic, with no requirement for operator intervention during normal operation. The control and distribution system of the power supply will be designed to minimize the impact of blackouts and brownouts. The power distribution shut down system will be prioritized to protect critical systems.

The generators will be equipped with a fire protection system that includes emergency stop stations, heat detectors, fire suppression equipment, flame detectors, internal sirens and external beacons. The gensets will also be supplied with primary heat exchangers on the main engine blocks and secondary exhaust gas heat recovery units as well. The waste heat will be used to heat the buildings in the industrial complex.

The exhaust from the gensets will be filtered (for particulates) by a standard filter system supplied with the generators and discharged to the atmosphere. Engine emissions are identified in Section 7.2: Air Quality. The insulated genset enclosures and the exhaust discharge silencers will limit noise to within regulated levels.

2.10.5 Fuel Storage Farm

The fuel farm located in the center of the industrial area will include storage tanks for diesel fuel, propane and a small amount of gasoline. The largest consumption of diesel fuel will be for power generation. Propane will be used to heat the mine ventilation air.

All project vehicles will be diesel powered. Gasoline will be reserved for small tools used on the surface (such as chain saws). The estimated consumption of diesel fuel and propane is listed in Table 2.10-1.

During the feasibility study, a trade-off study will be completed to compare the use of propane with electricity from diesel for space heating where recovered heat energy is either insufficient or not available. The current assumption for fuel use is based on the maximum use of electricity for space heating and the minimum use of propane. This combination is considered the most conservative from an environmental perspective (i.e., has the greatest potential adverse impact on the environment). Propane for heating mine air will be stored in tanks near the heaters. If studies show that propane should be used for space heating, then these propane tanks will be arranged close to the diesel fuel tanks.

Table 2.10-1 Projected Annual Diesel Fuel and Propane Consumption

Fuel Type	Application	Total (x000 L/y)
Diesel	Underground mining fleet	1,241
	Surface vehicles fleet	559
	Power generation	32,231
	Contingency allowance (15%)	5,105
	Total diesel fuel	**39,136**
Propane	Propane (for mine air heating only)	3,530
	Contingency allowance (15%)	529
	Total propane	**4,059**

The diesel storage tanks will provide approximately two weeks supply when demand is at its peak in midwinter The diesel fuel containment area and the storage tanks will be designed and constructed to meet codes and regulations. The tanks will be either double walled tank or a conventional single walled tank arranged in a sealed containment having a capacity of 110% of the tank. One or more tanks will be located in a lined containment to prevent contamination of soil in case of accidental discharge of the fuel. The fuel will be automatically pumped via underground pipes to day tanks of the power plant. The tanks will also be equipped with metering dispenser pumps for fuelling vehicles. When a truck is delivering fuel or a vehicle is being fueled, it will stand on a concrete platform over a sump equipped with an oil water separator. All electrical equipment will be flame proof. A lined storage facility will be constructed within the fuel farm area to store hazardous waste held in segregation pending periodic off-site shipment.

2.10.6 Explosives Storage

The existing explosives and detonator magazines (70,000 kg explosive supply) will be relocated to approximately 0.6 km west of the Portal 1345 (Figure 2.10-3). Electrical power will be provided for space heating and lighting via an overhead cable from the power plant. Fire protection will be provided by handheld canisters.

2.10.7 Laboratory

To minimize dust and vibrations associated with ore crushing and processing, the assay laboratory will be located to the west of the industrial complex buildings (Figure 2.10-3). The lab will be equipped with facilities to allow for sample crushing, pulverizing, wet

assaying and fire assaying. Exhausting fume cabinets and dust extractors will vent dust and fumes to the exterior.

2.10.8 Temporary Waste Rock Pad

The temporary waste rock pad was constructed in July 2005 to accommodate waste rock from underground development generated during the test mining program. It has sufficient capacity for additional underground development proposed for 2006, and will be decommissioned once the tailings facility is in operation. Section 2.7: Waste Rock Disposal provides a description of the existing facility and decommissioning of the waste rock pad.

2.10.9 Camp

The camp will be located approximately 2 km south-east from the industrial area. The layout will incorporate the accommodation and communal units, utilities and limited parking. The projected population of the camp during operations and the peak population during construction are projected to be similar (150 persons). The project is not planning a construction camp. Instead, the permanent camp is proposed for construction in 2006 and refurbished to as-new condition during the project commissioning phase.

The camp buildings will be modular and factory built in order to minimize on site construction time and labour and to ensure quality fabrication. During the feasibility study, Yukon Zinc intends to challenge potential suppliers of the camp to develop innovative, pleasing designs. Single or two storey units will be entertained provided they meet overall expectations. Therefore, this EA Report indicates the conceptual layout. The area occupied by the camp will be of the order of 125 m x 80 m (Figure 2.10-4). The camp will include sleeping units, ablution units containing shower and bathroom facilities, communal cafeteria-style kitchen and indoor recreational facilities such as TV, reading, games and weight rooms. Room arrangements will be hotel style so that an employee who is off shift will give up his or her room for use by another. Lockers will be provided for storage of personal effects.

The camp will be supplied with electricity, hot and cold water, sewage disposal, and telecommunications utilities. Electric power for the camp will be generated at the industrial area. Propane will be required for the kitchen facilities, but bulk storage is not proposed.

Only limited parking will be provided since it is intended that employees will not bring personal vehicles on site. They will travel to the project by bus or plane. A bus and pickups will be used to move around the site. The camp site will not be fenced.

The camp will be provided with hand held fire extinguishers, fire hydrants, hose reels and sprinklers. Fire fighting water will be supplied from the bottom of the main water storage tank and distributed via a fire main using an underwriters approved diesel powered fire pump.

The camp first aid facility will be a designated, fully serviced room at a strategic location within the complex. It will be subsidiary to the main first aid station in the industrial area.

2.10.9.1 Water Supply and Storage

Water will be obtained from a well located in the Go Creek drainage near the airstrip (Figure 2.10-4), and stored in a heated and insulated tank at the camp. It will be designed

to provide sufficient storage for fire fighting (2 h of storage for firewater at 340 m^3/h) plus 4 h of storage for potable water. The storage tank will be re-filled continuously. Water for fire fighting will be distributed in a dedicated fire water line.

2.10.10 Airstrip

The project will utilize the existing 800 m long gravel airstrip (Figure 2.10-2). The airstrip is capable of handling twin-engine turbo prop commuter planes. The airstrip will be used for freight deliveries during the initial construction season and to transport workers from Whitehorse during site construction and operation. The airstrip will be equipped with navigation aids (i.e., directional beacons) and landing lights. Power will be provided via transmission lines from the power generation plant located in the industrial complex. A small building will be erected to accommodate a waiting room and small storage area.

2.10.11 Tailings Facility

The tailings facility located approximately 4 km south-east of the industrial complex will consist of a collection pond and dam to provide containment. Buried, heat-traced and insulted piping will be installed to discharge the tailings from the process plant and to return reclaimed water to the plant (Figure 2.10-2). Reclaim water pumps will be installed at the tailings facility. The pump station will be located on a concrete slab and power for the pump station will be provided from the industrial area. Additional details are provided in Section 2.8: Tailings Disposal

2.10.12 Borrow Area

Construction aggregates will be obtained from a deposit beside the airstrip (Figure 2.10-2) and cut areas excavated during access road construction (specific areas to be determined upon final road design). A portable road contractor's type diesel powered screening plant will be set up beside the airstrip borrow area. The plant will be operated in conjunction with a front-end loader. Gravel trucks will transport the finished sand and gravel to stockpiles nearer to the points of use, e.g., the batch plant at the industrial complex. Consideration will be given to retaining the screening plant after the construction phase or to returning it periodically to prepare additional materials for operational uses (mainly as road dressing for underground and on surface). Runoff into and from the borrow area will be controlled with ditches, silt fences and settling ponds, which will discharge to the tailings facility

2.10.13 Waste Disposal

The management of ore process-related waste is described in Section 2.7: Waste Rock Disposal, Section 2.8: Tailing Disposal, and Section 2.9: Site Water Management. In addition to these mining-related wastes, the five categories of waste that will be generated at the industrial site and camp include: domestic waste, sewage, non-hazardous and hazardous waste and special waste. Section 9.4: Waste Management Plan describes the types of wastes, and their required handling and disposal.

2.10.13.1 Incinerator

A diesel/waste oil fueled two chamber incinerator will be installed on a concrete pad surrounded with a fence near the tailings facility (Figure 2.10-2). Incinerator ash will be disposed of in the landfill.

2.10.13.2 Landfill

A small landfill will be constructed for the disposal of inert waste adjacent to the incinerator (Figure 2.10-2). A compacted pad of overburden material will be used for initial placement of wastes. This pad will have a minimum thickness of 1.5m to ensure adequate separation from groundwater. Waste will be compacted and covered with layers of compacted natural overburden. The landfill will be fenced, signs will be posted and long term markers will be surveyed.

2.10.14 Transportation

Most travel within the project area will be between or within the industrial area and the camp area on existing roads that were constructed during previous exploration campaigns (Figure 1.2-3). Almost all internal traffic will be confined to this single artery which will provide access to the temporary waste rock pad, landfill, camp site, tailings facility, borrow pit and airstrip. Vehicles using the site roads will be industrial trucks, earthmoving equipment, crew buses, light utility trucks and highway transport trucks. There will be no private cars. Transportation to and from the site is presented in Section 2.11: Transportation.

2.10.15 Communications

External voice and data communications will be provided by satellite. An internal telephone system will be installed. A leaky feeder will be installed throughout the underground workings so that radios can be used underground. Surface vehicles will be equipped with radios. The radio base station will be set up to communicate with aircraft and vehicles accessing the site from the Robert Campbell Highway.